IN THE CLAIMS:

Please add claims 44-64 as provided below.

1. (Original) An ion shower, comprising:

a plasma source operable to generate source gas ions within a chamber;

an extraction assembly associated with a top portion of the chamber, and operable to extract ions from the top portion thereof; and

a workpiece support structure associated with the top portion of the chamber, and operable to secure the workpiece having an implantation surface orientated facing downward toward the extraction assembly for implantation thereof.

2. (Original) The ion shower of claim 1, wherein the chamber further comprises a bottom portion and side portions, and wherein the plasma source comprises an inductively coupled plasma source.

3. (Original) The ion shower of claim 1, wherein the chamber further comprises a bottom portion and side portions, and wherein the side portions comprise a plurality of multi-cusp magnet devices operable to produce multi-cusp magnetic fields thereat to facilitate an azimuthal uniformity of plasma within the chamber.

4. (Original) The ion shower of claim 3, wherein the multi-cusp magnet devices comprise electromagnets operable to provide a variation in multi-cusp magnetic field strength at differing positions along the side portions.

5. (Original) The ion shower of claim 4, wherein the electromagnets are independently controllable, thereby facilitating a tuning of the multi-cusp magnetic fields.

6. (Original) The ion shower of claim 1, wherein when the plasma source is deactivated any contaminants suspended within the plasma fall toward a bottom portion of the chamber away from the extraction assembly due to an influence of gravity, thereby preventing such contaminants from reaching the workpiece.

7. (Original) The ion shower of claim 1, wherein the plasma source further comprises two grounding rods operable to collect excess electrons within the chamber during extraction of ions from the top portion thereof.

8. (Original) The ion shower of claim 7, wherein the two grounding rods are doped silicon, and wherein when one of the grounding rods is grounded, the other grounding rod is negatively biased with respect to plasma within the chamber, thereby causing the other grounding rod to be sputtered by the plasma and substantially preventing the other grounding rod from becoming an insulator due to excessive oxidation thereof.

9. (Original) The ion shower of claim 8, wherein the two grounding rods are coupled to a square-wave voltage associated with the plasma source, and wherein a phase difference of the square-wave voltages between the two grounding rods is approximately 180 degrees.

10. (Original) The ion shower of claim 1, wherein the extraction assembly comprises a plurality of extraction electrodes vertically oriented with respect to one another and operable to extract the ions vertically from the top portion of the chamber.

11. (Original) The ion shower of claim 10, wherein a first extraction electrode of the plurality of extraction electrodes is closest to the plasma within the chamber and comprises a plurality of extraction apertures extending therethrough.

12. (Original) The ion shower of claim 11, wherein the plurality of extraction apertures extending through the first extraction electrode collectively have an area associated therewith and wherein a ratio of the area to the total area exposed to plasma defines a transparency, and wherein the transparency is less than 50%.

13. (Original) The ion shower of claim 12, wherein the transparency of the first extraction electrode is about 10%.

14. (Original) The ion shower of claim 12, wherein the first extraction electrode further comprises cooling passages therein, and wherein a cooling fluid flowing therethrough is operable to cool the first extraction electrode during extraction of ions from the chamber.

15. (Original) The ion shower of claim 11, wherein the extraction apertures of the first extraction electrode each have an area, and wherein extraction apertures of the other extraction electrodes are substantially aligned with the first extraction electrode extraction apertures, respectively.

16. (Original) The ion shower of claim 15, wherein the extraction apertures of the other extraction electrodes have respective areas that are greater than the area of the first extraction electrode apertures.

17. (Original) The ion shower of claim 11, wherein at least one of the other extraction electrodes further comprise interstitial pumping apertures, wherein the interstitial pumping apertures reduce a pressure near the extraction assembly external to the chamber.

18. (Original) The ion shower of claim 17, wherein the interstitial pumping apertures have an area greater than an area of the extraction apertures of the first extraction electrode.

19. (Original) The ion shower of claim 11, wherein a spatial density of the extraction electrodes about the first extraction electrode is non-uniform.

20. (Original) The ion shower of claim 19, wherein the spatial density of the extraction apertures is greater along an outer periphery of the first extraction electrode than a center portion thereof, and wherein the non-uniform spatial density of the extraction apertures serve to compensate for any plasma non-uniformity within the chamber, thereby resulting in greater beam uniformity at the workpiece.

21. (Original) The ion shower of claim 1, wherein the source gas ions comprise oxygen ions.

22. (Original) The ion shower of claim 1, further comprising an evaporative cooling unit in heat transfer communication with a top portion of the workpiece support structure, and operable to cool the workpiece via evaporative cooling during an implantation thereof.

23. (Original) The ion shower of claim 1, wherein the chamber comprises a large volume chamber.

24. (Original) The ion shower of claim 23, wherein a cross sectional area of the large volume chamber is substantially larger than an area of the workpiece, thereby helping ensure a substantially uniform plasma about an area corresponding to the workpiece, thus resulting in substantially uniform beam current across the workpiece.

25. (Original) The ion shower of claim 23, wherein a ratio of chamber volume to chamber surface area is substantially large, wherein a number of ions generated within the chamber volume greatly exceed an amount of recombination associated with the chamber surface.

26. (Original) The ion shower of claim 25, wherein the source gas ions comprise oxygen and an O+/O2+ oxygen fraction within the chamber is at least 98%.

27. (Original) The ion shower of claim 23, wherein the workpiece comprises a 300 mm wafer, and the large volume chamber has a height of about 60 cm and a diameter of about 80 cm.

28. (Original) A method of implanting oxygen ions into a workpiece, comprising:

generating a plasma containing oxygen ions within a chamber, the chamber comprising a bottom portion, side portions, and a top portion; and

extracting oxygen ions from the top portion of the chamber and directing the extracted oxygen ions toward the workpiece having an implantation surface facing downward toward the chamber.

29. (Original) The method of claim 28, wherein generating the plasma comprises:

feeding an oxygen gas into the chamber; and

accelerating electrons in the chamber using RF electric fields, wherein the accelerating electrons collide with oxygen gas molecules and cause an ionization thereof.

30. (Original) The method of claim 29, further comprising radially confining the plasma along the side portions of the chamber, thereby facilitating a substantially azimuthally uniform plasma within the chamber.

31. (Original) The method of claim 30, wherein radially confining the plasma comprises positioning multi-cusp magnet devices on the side portions of the chamber, wherein the multi-cusp magnet devices generate multi-cusp magnetic fields that extend from the side portions of the chamber toward a center portion thereof.

32. (Original) The method of claim 31, wherein the multi-cusp magnet devices comprise electromagnets, and wherein radially confining the plasma comprises controlling the electromagnets to vary the strength of the multi-cusp magnetic fields.

33. (Original) The method of claim 28, wherein extracting the oxygen ions from the top portion of the chamber comprises:

biasing one or more extraction electrodes associated with the top portion of the chamber, thereby generating an electric field thereat for vertical extraction of oxygen ions from the chamber.

34. (Original) The method of claim 28, further comprising collecting excess electrons from the chamber with a plurality of doped silicon grounding rods within the chamber during the extraction of oxygen ions from the chamber.

35. (Original) The method of claim 34, further comprising:

maintaining one of the silicon coated grounding rods at a ground potential to collect excess electrons from within the chamber; and

concurrently maintaining another of the silicon coated grounding rods at a negative potential, thereby causing the negatively biased grounding rod to be sputtered, and removing any silicon dioxide that may have formed thereon.

36. (Original) The method of claim 35, further comprising alternating the ground biasing and negative biasing among the plurality of silicon coated grounding rods, thereby ensuring that at least one of the grounding rods is sufficiently conductive to collect excess electrons during extraction and thereby preventing the plasma from being extinguished.

37. (Original) The method of claim 28, further comprising establishing a volume to surface area ratio of the chamber that is large enough to obtain an O+/O2+ oxygen fraction of at least 98%.

38. (Original) An ion shower, comprising:

a plasma source operable to generate oxygen ions within a chamber having a first pressure;

a workpiece support structure associated with the chamber, and operable to secure a workpiece for implantation thereof; and

an extraction assembly disposed between the chamber and the workpiece support structure, the extraction assembly comprising a plurality of electrodes, wherein a first electrode comprises a plasma electrode having a plurality of extraction apertures associated therewith, and a second electrode comprises an extraction electrode biased negatively with respect to the chamber and disposed between the plasma electrode and the workpiece support structure, the extraction electrode having a plurality of extraction apertures substantially aligned with respect to the plasma electrode extraction apertures, and further comprising one or more interstitial pumping apertures operable to reduce a pressure thereat to a second pressure substantially less than the first pressure.

39. (Original) The ion shower of claim 38, wherein the extraction assembly further comprises a ground electrode disposed between the extraction electrode and the workpiece support structure, and wherein the ground electrode is biased at a

voltage of the workpiece support structure that is biased negatively with respect to the plasma within the chamber, and wherein the ground electrode comprises a plurality of extraction apertures substantially aligned to the plasma electrode extraction apertures, and comprises one or more interstitial pumping apertures.

40. (Original) The ion shower of claim 39, the extraction assembly further comprising a suppression electrode disposed between the ground electrode and the extraction electrode, the suppression electrode biased negatively with respect to the ground electrode, and operable to prevent electrons local to the workpiece support structure from entering the extraction assembly, wherein the suppression electrode comprises a plurality of extraction apertures substantially aligned to the plasma electrode extraction apertures, and comprises one or more interstitial pumping apertures.

41. (Original) The ion shower of claim 40, the extraction assembly further comprising an auxiliary electrode disposed between the extraction electrode and the suppression electrode, wherein the auxiliary electrode is biased negatively with respect to the extraction electrode and positively with respect to the suppression electrode.

42. (Original) The ion shower of claim 38, further comprising a pump component associated with the workpiece support structure, and operable to remove neutral species from the chamber and extraction assembly through the interstitial pumping apertures.

43. (Original) A method of extracting ions from a chamber containing a plasma using an extraction assembly, comprising:

providing a plasma electrode having a plurality of extraction apertures associated therewith, wherein the plasma electrode is biased at a potential of the plasma; and

providing an extraction electrode having a plurality of extraction apertures substantially aligned with respect to the plasma electrode extraction apertures, wherein the extraction electrode is biased negatively with respect to the plasma electrode, thereby forming an electrostatic field therebetween, wherein the extraction electrode further comprises a plurality of interstitial pumping apertures.

44. (New) A non-mass analyzed ion implantation system comprising:

a plasma chamber including a plasma source operable to generate source gas ions therein;

an extraction assembly operable to extract ions from the plasma chamber;

a process chamber for receiving the ions extracted from the extraction assembly; and

a workpiece support assembly situated in said process chamber, and operable to secure a workpiece in an orientation for being implanted by the ions extracted.

45. (New) The non-mass analyzed ion implantation system of claim 44, wherein the extraction assembly is associated with a top portion of the plasma chamber, and is operable to extract ions from the top portion thereof, and

wherein the workpiece support assembly is operable to secure the workpiece having an implantation surface orientated facing downward toward the extraction assembly for implantation thereof.

46. (New) The ion shower of claim 45, wherein the plasma chamber further comprises a bottom portion and side portions, and wherein the plasma source comprises an inductively coupled plasma source.

47. (New) The ion shower of claim 45, wherein the plasma chamber further comprises a bottom portion and side portions, and wherein the side portions comprise a plurality of multi-cusp magnet devices operable to produce multi-cusp magnetic fields

thereat to facilitate an azimuthal uniformity of plasma within the plasma chamber.

48. (New) The ion shower of claim 47, wherein the multi-cusp magnet devices comprise electromagnets operable to provide a variation in multi-cusp magnetic field strength at differing positions along the side portions.

49. (New) The ion shower of claim 48, wherein the electromagnets are independently controllable, thereby facilitating a tuning of the multi-cusp magnetic fields.

50. (New) The ion shower of claim 45, wherein when the plasma source is deactivated any contaminants suspended within the plasma fall toward a bottom portion of the chamber away from the extraction assembly due to an influence of gravity, thereby preventing such contaminants from reaching the workpiece.

51. (New) The ion shower of claim 45, wherein the plasma source further comprises two grounding rods operable to collect excess electrons within the plasma chamber during extraction of ions from the top portion thereof.

52. (New) The ion shower of claim 51, wherein the two grounding rods are doped silicon, and wherein when one of the grounding rods is grounded, the other grounding rod is negatively biased with respect to plasma within the plasma chamber, thereby causing the other grounding rod to be sputtered by the plasma and substantially preventing the other grounding rod from becoming an insulator due to excessive oxidation thereof.

53. (New) The ion shower of claim 52, wherein the two grounding rods are coupled to a square-wave voltage associated with the plasma source, and wherein a phase difference of the square-wave voltages between the two grounding rods is

approximately 180 degrees.

54. (New) The ion shower of claim 45, wherein the extraction assembly comprises a plurality of extraction electrodes vertically oriented with respect to one another and operable to extract the ions vertically from the top portion of the plasma chamber.

55. (New) The ion shower of claim 54, wherein a first extraction electrode of the plurality of extraction electrodes is closest to the plasma within the chamber and comprises a plurality of extraction apertures extending therethrough.

56. (New) The ion shower of claim 55, wherein the plurality of extraction apertures extending through the first extraction electrode collectively have an area associated therewith and wherein a ratio of the area to the total area exposed to plasma defines a transparency, and wherein the transparency is less than 50%.

57. (New) The ion shower of claim 56, wherein the first extraction electrode further comprises cooling passages therein, and wherein a cooling fluid flowing therethrough is operable to cool the first extraction electrode during extraction of ions from the chamber.

58. (New) The ion shower of claim 55, wherein the extraction apertures of the first extraction electrode each have an area, and wherein extraction apertures of the other extraction electrodes are substantially aligned with the first extraction electrode extraction apertures, respectively.

59. (New) The ion shower of claim 58, wherein the extraction apertures of the other extraction electrodes have respective areas that are greater than the area of the first extraction electrode apertures.

60. (New) The ion shower of claim 55, wherein at least one of the other extraction electrodes further comprise interstitial pumping apertures, wherein the interstitial pumping apertures reduce a pressure near the extraction assembly external to the chamber.

61. (New) The ion shower of claim 60, wherein the interstitial pumping apertures have an area greater than an area of the extraction apertures of the first extraction electrode.

62. (New) The ion shower of claim 54, wherein a spatial density of the extraction electrodes about the first extraction electrode is non-uniform.

63. (New) The ion shower of claim 62, wherein the spatial density of the extraction apertures is greater along an outer periphery of the first extraction electrode than a center portion thereof, and wherein the non-uniform spatial density of the extraction apertures serve to compensate for any plasma non-uniformity within the chamber, thereby resulting in greater beam uniformity at the workpiece.

64. (New) The ion shower of claim 45, further comprising an evaporative cooling unit in heat transfer communication with a top portion of the workpiece support assembly, and operable to cool the workpiece *via* evaporative cooling during an implantation thereof.